

NON-PUBLIC?: N

ACCESSION #: 9403180072

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Salem Generating Station - Unit 1 PAGE: 1 OF 05

DOCKET NUMBER: 05000272

TITLE: Turbine Trip Due To Loss of Direct Current Control Power
To Electro-Hydraulic Control Syst.

EVENT DATE: 02/10/94 LER #: 94-005-00 REPORT DATE: 03/11/94

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 99

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10
CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: M. J. Pastva, Jr. - LER Coordinator TELEPHONE: (609) 339-5165

COMPONENT FAILURE DESCRIPTION:

CAUSE: SYSTEM: COMPONENT: MANUFACTURER:

REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On 2/10/94, hours, at 1258 hours, a control power failure of the turbine Electro-Hydraulic Control (EHC) System occurred causing a turbine/reactor trip. The Unit was stabilized in Mode 3, at approximately 1315 hours (same day). Insufficient margin between the EHC overvoltage protection setpoints and normal EHC power supply voltage allowed a variation in voltage to actuate the overvoltage protection circuitry. The margin resulted from design/installation of the EHC power supplies and use of a 17.3VDC setpoint. A contributor was EHC procedures that did not record power supply voltages in a manner that would reveal a reduced margin to trip. No component failures were identified as contributors to this event. EHC power supplies were monitored and no problems or transients/pulses were recorded. The overvoltage protection circuits were replaced and the circuits, setpoints were reset to 17.9 .1 VDC, and the EHC VDC bus wiring was reworked. Procedure changes have been implemented to ensure adequate margin below the overvoltage protection setpoint. The A 115V power supply was replaced and additional testing will be conducted to evaluate transient effects. During the next Unit 2 outage, voltage readings of the Unit 2 EHC 15VDC power supply will be taken to verify adequacy of the overvoltage protection margin to trip setpoint.

END OF ABSTRACT

ATTACHMENT TO 9403180072 PAGE 1 OF 2

Table "REQUIRED NUMBER OF DIGITS/CHARACTERS FOR EACH BLOCK" omitted.

TEXT PAGE 2 OF 5

PLANT AND SYSTEM IDENTIFICATION:

Westinghouse - Pressurized Water Reactor

Energy Industry Identification System (EIS) codes are identified in the text as {xx}

IDENTIFICATION OF OCCURRENCE:

Turbine/Reactor Trip Due To Loss Of Direct Current Control Power To Electro-Hydraulic Control System

Event Date: 2/10/94

Report Date: 3/11/94

This report was initiated by Incident Report No. 94-045.

CONDITIONS PRIOR TO OCCURRENCE:

Mode 1 Reactor Power 99% - Unit Load 1136 MWe

DESCRIPTION OF OCCURRENCE:

On February 10, 1994, at 1258 hours, a turbine/reactor trip {JC} occurred due to a turbine trip signal while above the P-9 reactor power interlock setpoint. The turbine trip was initiated from a direct current (DC) control power failure of the turbine Electro-Hydraulic Control (EHC) System. Emergency Operating

Procedure (EOP)-TRIP-1, "Reactor Trip Or Safety Injection" and EOP-TRIP-2, "Reactor Trip Response" were entered and the Unit was stabilized in Mode 3, at approximately 1315 hours (same day).

At 1403 hours (same day) the NRC was notified of this event in accordance with 10CFR50.72(b)(2)(ii).

ANALYSIS OF OCCURRENCE:

The turbine EHC system controls steam flow through the turbine to govern turbine speed and load during startup, normal operation and shutdown. In addition, the system trips the turbine if required.

The two volt DC control power supplies (A and B) to the system are utilized via an auctioneering circuit. over-voltage protection of the EHC power supplies is provided. Loss of both power supplies is indicated by a Control Room overhead alarm annunciator "EH DC PWR FAIL" first out window (F-32).

The turbine/reactor trip occurred due to a DC control power failure of the turbine EHC System which caused a turbine trip signal while above

TEXT PAGE 3 OF 5

ANALYSIS OF OCCURRENCE: (cont'd)

the P-9 reactor power interlock setpoint ($\geq 50\%$ rated thermal power). Emergency Operating Procedure (EOP)-TRIP-1, "Reactor Trip Or Safety Injection", was entered. Main Steam was isolated in accordance with EOP-TRIP-2, "Reactor Trip Response" to limit

cooldown of the Reactor Coolant System {AB}. The Unit was stabilized and placed in Mode 3 and Integrated operating Procedure IOP-8 was entered.

This event resulted from insufficient margin between the overvoltage protection setpoints and normal EHC power supply voltage.

Consequently, a variation in voltage actuated the overvoltage protection circuitry. The A power supply was set at approximately 220 millivolts (mV) below the overvoltage protection setpoint of 17.3 volts and the B power supply was set at approximately 340 mV below the overvoltage protection setpoint of 17.3 volts. Guidance for the power supply, Lambda Electronics, Division of VEEC Instrument Co., recommends a setpoint of 115% of the power supply voltage plus 1.0 volt (i.e. > 18 volts). The Westinghouse EHC field calibration procedure recommends an overvoltage protection setpoint of 17.3 volts. However, Engineering & Plant Betterment analysis determined 18VDC as the maximum overvoltage protection setpoint.

Probable contributors to the insufficient setpoint margins:

- The power supply bus employed 18 gauge wiring, which may contribute to high line resistance which caused voltage drops from the power supply to the bus. Encountered high line resistance has required setting the power supply voltage relatively high in order to maintain proper bus voltage.
- Improperly crimped and loose wiring lugs in the power distribution panel wiring, confirmed by observed voltage transients during movement of the power supply output wiring.

- Recommendations in the Westinghouse EHC field calibration procedure required the overvoltage protection setpoint to be 17.3 volts, which was used by PSE&G.
- The potentiometer used to adjust the A power supply showed erratic response/high sensitivity to adjustments.
- EHC calibration procedure did not record power supply voltages in a manner that would reveal a reduced margin to trip.

No component failures were identified as contributors to this event. In addition, the loss of one 15 volt power supply resulting in loss

TEXT PAGE 4 OF 5

ANALYSIS OF OCCURRENCE: (cont'd)

of the other could not be duplicated. However, troubleshooting showed that the A power supply did not adequately control under large load transients.

At the time of this event, efforts were in progress to develop design changes to replace and upgrade the power supplies in response to previously encountered EHC power supply and distribution chassis problems, dating back to August 1992.

APPARENT CAUSE OF OCCURRENCE:

The cause of this event is "Design, Manufacturing, Construction/Installation", as classified in Appendix B of

NUREG-1022. Methods used during installation and design of the EHC power supplies (i.e. wire size used) resulted in minimum margin between the overvoltage protection setpoints and normal EHC power supply voltage. In addition, EHC calibration procedures did not record power supply voltages in a manner that would reveal a reduced margin to trip. The conservative 17.3VDC setpoint contributed to the reduced margin. No component failures were identified as contributors to this event.

PREVIOUS OCCURRENCES:

Review of documentation showed this event to be an isolated occurrence.

SAFETY SIGNIFICANCE:

This event did not affect the health and safety of the public. It is reportable as an automatic RPS actuation in accordance with 10 CFR50.73(a)(2)(iv).

The RPS functioned as designed and the heat sink was maintained during this event. The reduction in T sub avg, requiring main steamline isolation, has been experienced during other reactor trips (e.g., Unit 1 LER 272/93-002-00 and Unit 2 LER 311/92-009-00). Engineering is investigating T sub avg reduction following trips and potential corrective actions are being assessed.

CORRECTIVE ACTION:

EHC power supplies were monitored for voltage stability and no

problems or transients/pulses were recorded.

The overvoltage protection circuits were replaced and the overvoltage

TEXT PAGE 5 OF 5

CORRECTIVE ACTION: (cont'd)

protection setpoints reset to 17.9 .1 VDC to provide greater margin to trip.

The EHC VDC bus wiring was reworked to reduce voltage losses in the wiring.

Procedure changes have been implemented to require recording of final EHC power supply voltage values in order to ensure adequate margin below the overvoltage protection trip setpoint.

The A $\frac{1}{2}$ power supply, including its potentiometer, was replaced as a precautionary measure. The B $\frac{1}{2}$ power supply potentiometer was cycled to assure proper performance.

Additional testing of the replaced A power supply and the overvoltage protection circuits will be conducted to evaluate transient effects.

During the next Unit 2 outage, voltage readings of the Unit 2 EHC 15VDC power supply will be taken to verify adequacy of the overvoltage protection margin to trip setpoint.

PSE&G is continuing to investigate T sub avg reduction following reactor trips and potential corrective actions-are being assessed.

General Manager -
Salem Operations

MJPJ: pc

SORC Mtg. 94-022

ATTACHMENT TO 9403180072 PAGE 1 OF 1

PSE&G

Public Service Electric and Gas Company P. O. Box 236 Hancocks Bridge,
New Jersey 08038

Salem Generating Station

March 11, 1994

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Dear Sir:

SALEM GENERATING STATION
LICENSE NO. DPR-70

DOCKET NO. 50-272

UNIT NO. 1

LICENSEE EVENT REPORT 94-005-00

This Licensee Event Report is being submitted pursuant to the requirements of Code of Federal Regu

ation 10CFR50.73(a)(2)(iv).

Issuance of this report is required within thirty (30) days of event discovery.

Sincerely yours,

J. J. Hagan

General Manager -

Salem Operations

MJPJ: pc

Distribution

*** END OF DOCUMENT ***
